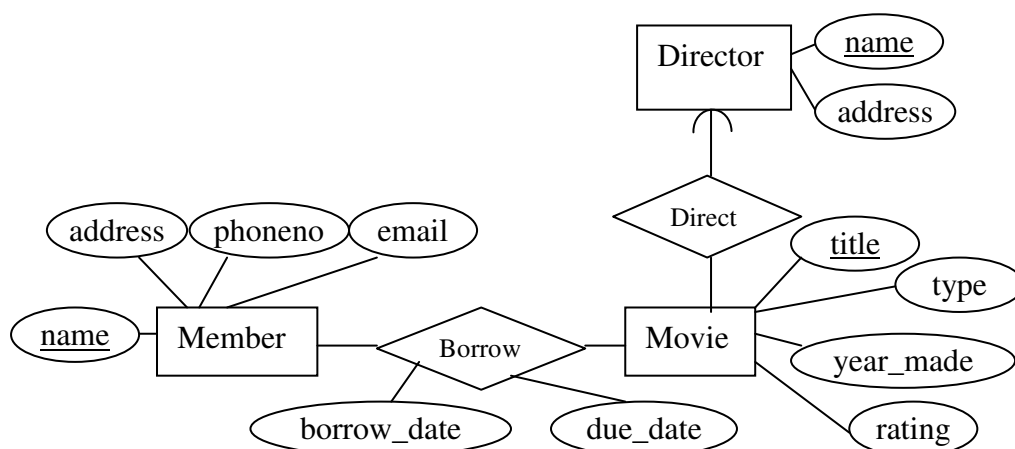


## ISYS1055/1057 Tutorial/Lab Sheet

### The Entity-Relationship Model 1

1. For each of the following description, complete tasks:
  - a. Draw an ER diagram showing entities, attributes, and relationships and their multiplicity. Where necessary state any assumptions.
  - b. Map the ER diagram into a relational database schema. Explicitly denote primary keys (underline) and foreign keys (asterisks \*) for relations in the resultant schema.
  - 1) Customers identified by a name and with an address purchase items. Items are identified by a number and have a colour . The quantity bought of each item is recorded.
  - 2) An order with a unique number and date can be made for any quantity of parts, each with an item identifier and colour . Each order is made by one supplier with a name and address.
2. Given the following description, draw an ER diagram and map it into a relational database schema. Explicitly denote primary keys and foreign keys of relations in the resultant schema. *Produce a pdf file containing your answers.* The ER diagram must use symbols in the lecture notes, and can be drawn with the Word drawing tool or any other software.

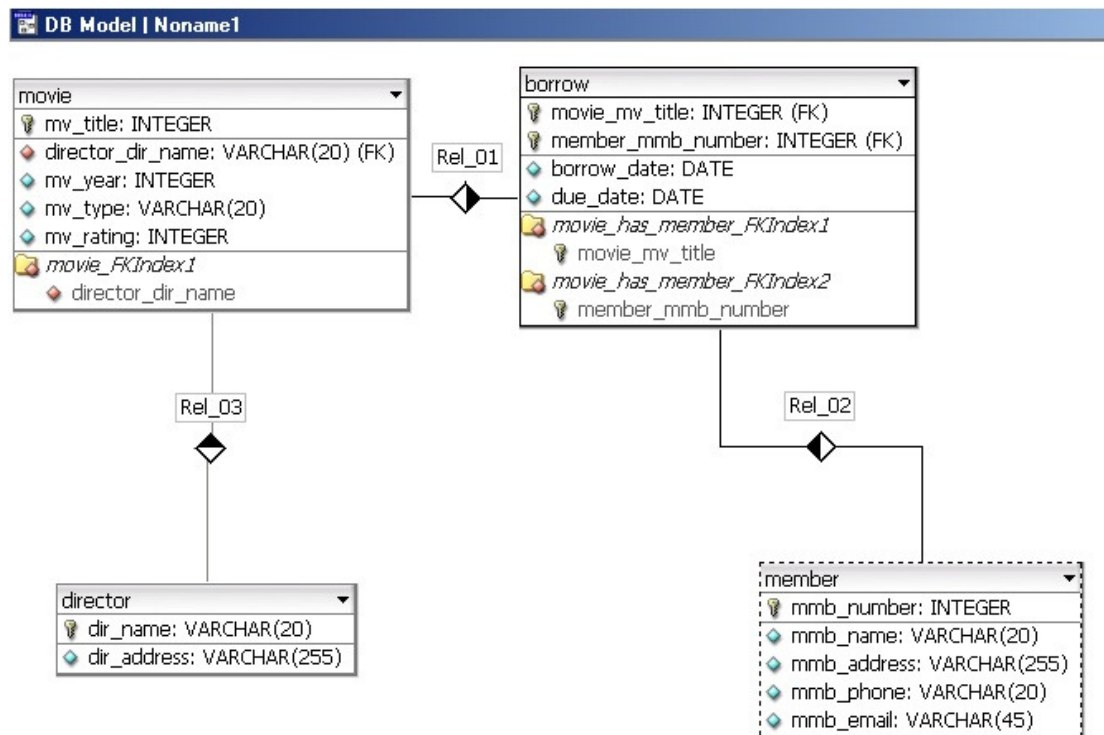
Departments are identified by an ID and have budget. For each department there are several projects, which have a name and start date.
3. Given below is an ER diagram for a “Movies” database. (a) Explain the assumptions made about the Borrow and Direct relationships in the ER diagram. (b) In the DB Designer 4 system, implement the ER diagram and map it into SQL DDL statements. Instructions on using the DB Designer 4 system will be given separately.



## Database Design using DBDesigner 4

Database design tools have been developed to automate the database design process, from a conceptual model to a relational database schema. DBDesigner 4 is a visual database design tool that integrates database design, modelling and creation. Specifically you can draw ER diagrams and automatically map them relational database schema definition SQL DDL statements. DBDesigner 4 can be freely downloaded from <http://www.fabforce.net/dbdesigner4/>.

In the DBDesigner 4 terminology, the core components in a database conceptual model (similar to an ER diagram) are tables (similar to entity sets) and relations (similar to relationships). A sample Movies database model built in DBDesigner 4 is shown below. Tables consist of table name, columns, indices and various table options. Relations connect different tables with each other to form one-one or one-many relations. Note that there are some restrictions in DBDesigner 4 modelling. For example, only binary relations are allowed. The DBDesigner 4 manual is on the Blackboard for downloading.



1. In the School of Computer Science and IT, DBDesigner 4 is installed on the blowfly Windows Server and is also installed on PCs in the Window labs. To start DBDesigner 4:

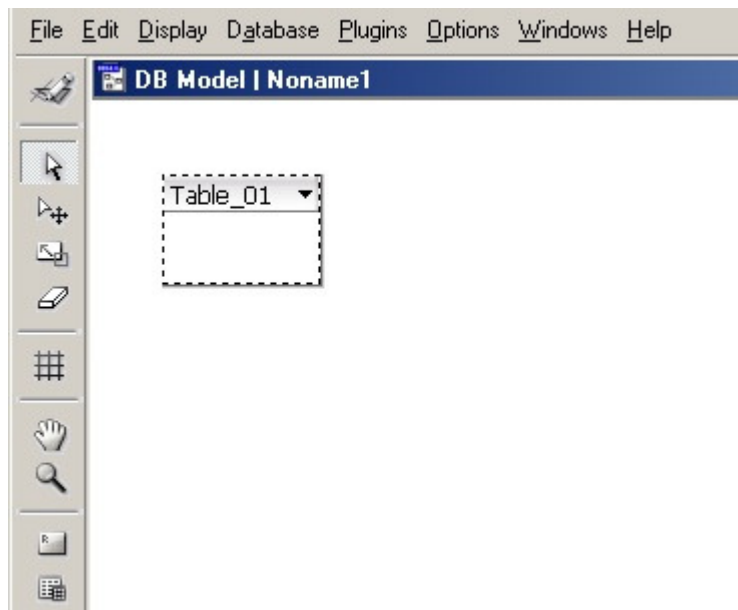
On a terminal, select and log into blowfly:

Start --> Programs --> FabForce --> DBDesigner 4

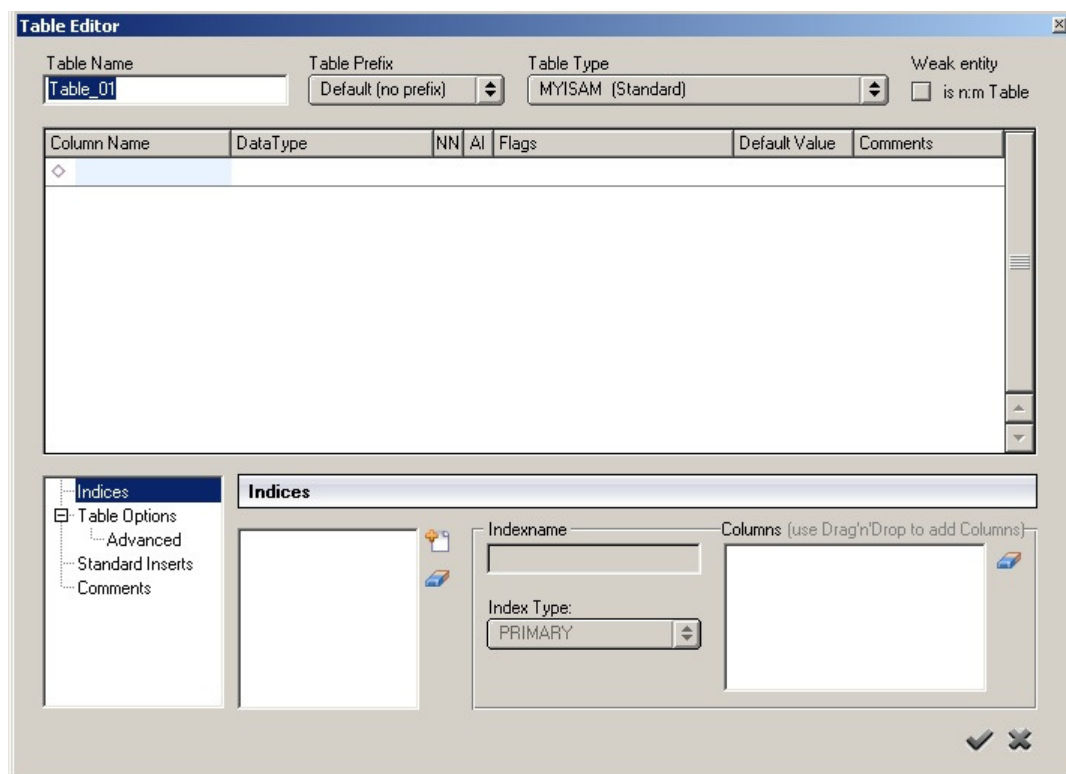
On a windows machine:

Start --> Programs --> (SCSIT) --> FabForce --> DBDesigner 4

2. On the left edge of the DB Designer window, there are icons for entities, relationships etc. Click the icon to create a new entity (in DB designer it is called a table). And, then click on the main window where you want to place the new entity.



3. then, double click on the top edge of the new entity to open a new window to enter details of this new entity. The new window should look like below.



- Enter the name of the new entity (in this example "Movie"), and the key attribute of the Movie entity (in this example "mv\_title") in appropriate boxes. See below.

**Table Editor**

Table Name:  Table Prefix:  Table Type:  Weak entity: ☐ is n:m Table

Column Name	DataType	NN	AI	Flags	Default Value	Comments
mv_title	Varchar(20)	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/> UNSIGNED <input type="checkbox"/> ZEROFILL		

- Enter the remaining attributes of the Movie entity, as follows.

**Table Editor**

Table Name:  Table Prefix:  Table Type:  Weak entity: ☐ is n:m Table

Column Name	DataType	NN	AI	Flags	Default Value	Comments
mv_title	INTEGER	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/> UNSIGNED <input type="checkbox"/> ZEROFILL		
mv_year	INTEGER	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/> UNSIGNED <input type="checkbox"/> ZEROFILL		
mv_type	VARCHAR(20)	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/> BINARY		
mv_rating	INTEGER	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/> UNSIGNED <input type="checkbox"/> ZEROFILL		

**Indices**

Table Options: ☐ Advanced ☐ Standard Inserts ☐ Comments

**Indices**

PRIMARY

Indexname:  Index Type:  Columns (use Drag'n'Drop to add Columns):

- When you are done with the list of attributes, click on the Tick button at the bottom right-hand corner of the window. Then, the attributes of the new entity will be updated on the main window. See below.

**DB Model | Noname1**

File Edit Display Database Plugins Options Windows Help

movie

- mv\_title: INTEGER
- mv\_year: INTEGER
- mv\_type: VARCHAR(20)
- mv\_rating: INTEGER

- Repeat the above steps to define Member, and its attributes.

**Table Editor**

Table Name: member    Table Prefix: Default (no prefix)    Table Type: MYISAM (Standard)    Weak entity: ☐ is n:m Table

Column Name	DataType	NN	AI	Flags	Default Value	Comments
mmb_number	INTEGER	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/> UNSIGNED <input type="checkbox"/> ZEROFILL		
mmb_name	VARCHAR(20)	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/> BINARY		
mmb_address	VARCHAR(255)	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/> BINARY		
mmb_phone	VARCHAR(20)	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/> BINARY		
mmb_email	VARCHAR(45)	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/> BINARY		

**Indices**

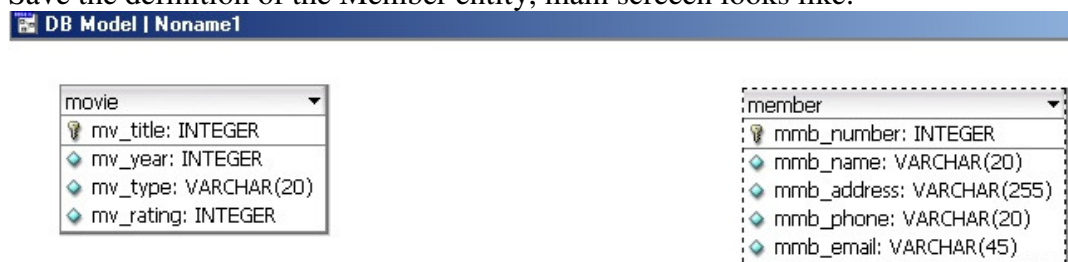
Table Options: ☐ Table Options, ☐ Advanced, ☐ Standard Inserts, ☐ Comments

**Indices**

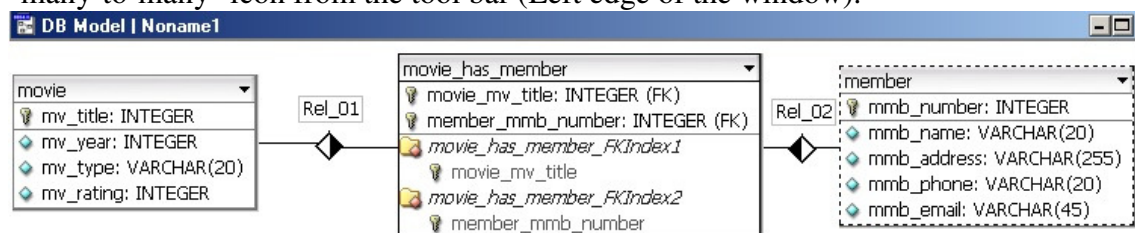
PRIMARY

Indexname: PRIMARY    Index Type: PRIMARY    Columns: mmb\_number

- Save the definition of the Member entity, main screen looks like:



- "Borrow" is a many-to-many relationship between these two entities. Click on the "many-to-many" icon from the tool bar (Left edge of the window).



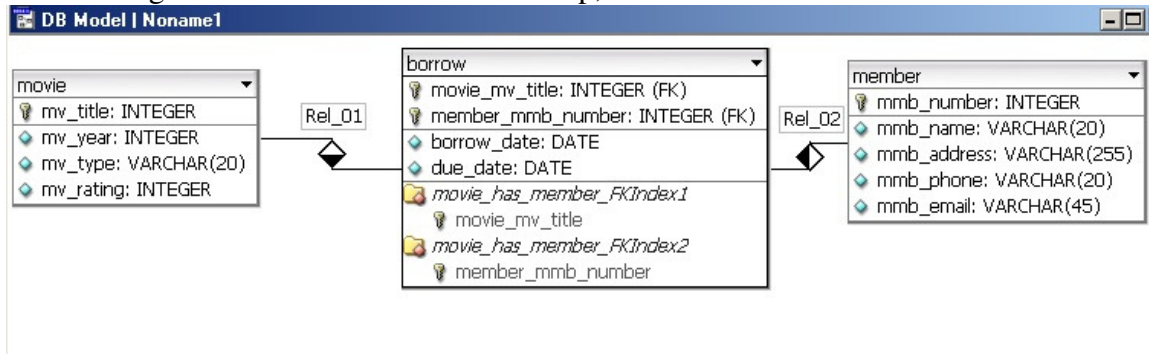
- Note that the relationship name generated by the system is not right. Double click on the Relationship icon to obtain a description window and enter the correct relationship name and the attributes borrow\_date and due\_date.

**Table Editor**

Table Name:  Table Prefix:  Table Type:  Weak entity: ☒ is n:m Table

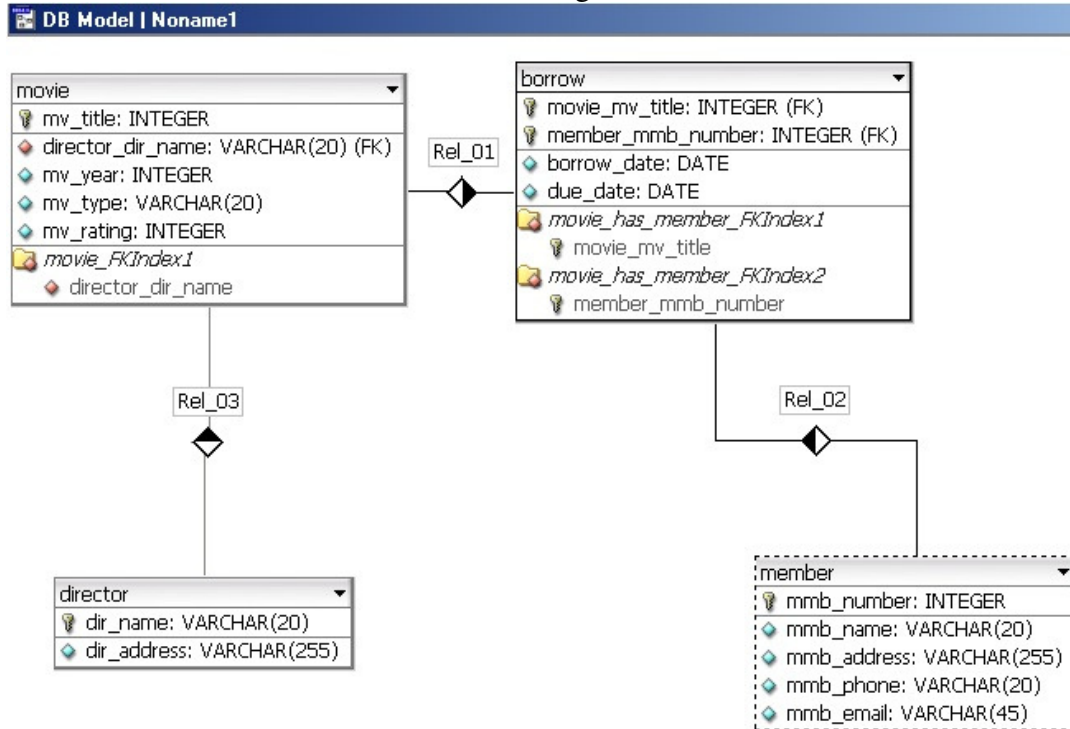
Column Name	Data Type	NN	AI	Flags	Default Value	Comments
movie_mv_title	INTEGER	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	UNSIGNED <input type="checkbox"/> ZEROFILL		
member_mmb_number	INTEGER	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	UNSIGNED <input type="checkbox"/> ZEROFILL		
borrow_date	DATE	<input type="checkbox"/>	<input type="checkbox"/>			
due_date	DATE	<input type="checkbox"/>	<input type="checkbox"/>			
<input type="text"/>						

11. After saving attributes of the new relationship, main window looks like below.

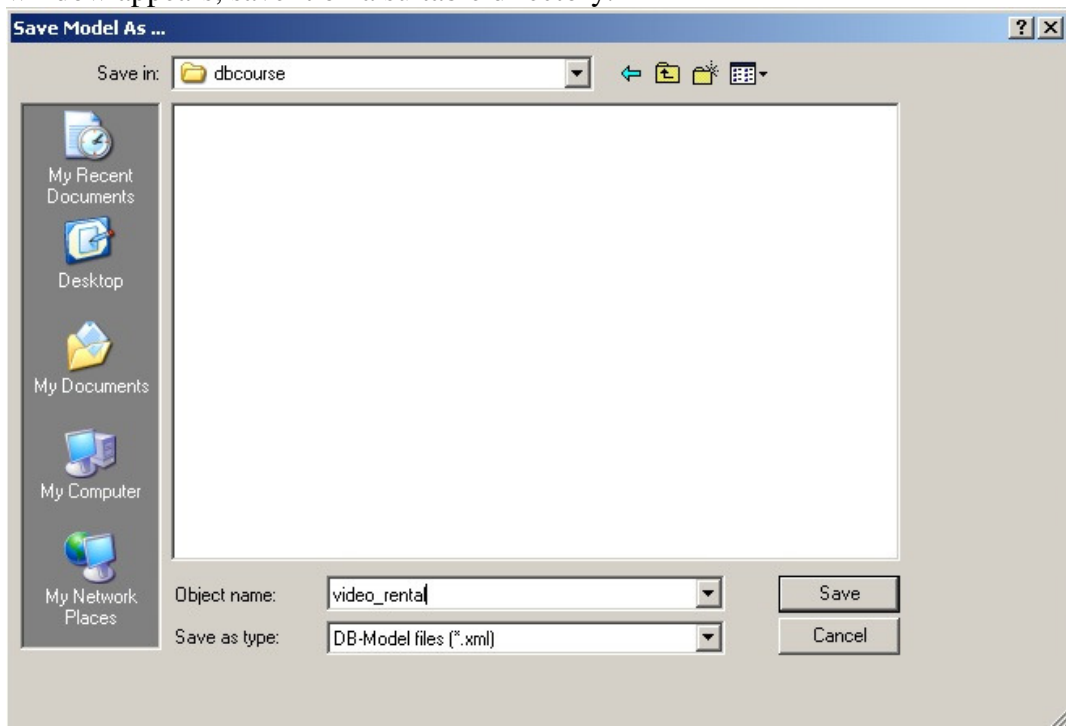


12. Add entity "Director" and its attributes, and establish a one-to-many relationship from Director to Movie. First click on the corresponding icon on the tool box, then

click on the "one" side. The resultant ER diagram looks like below.

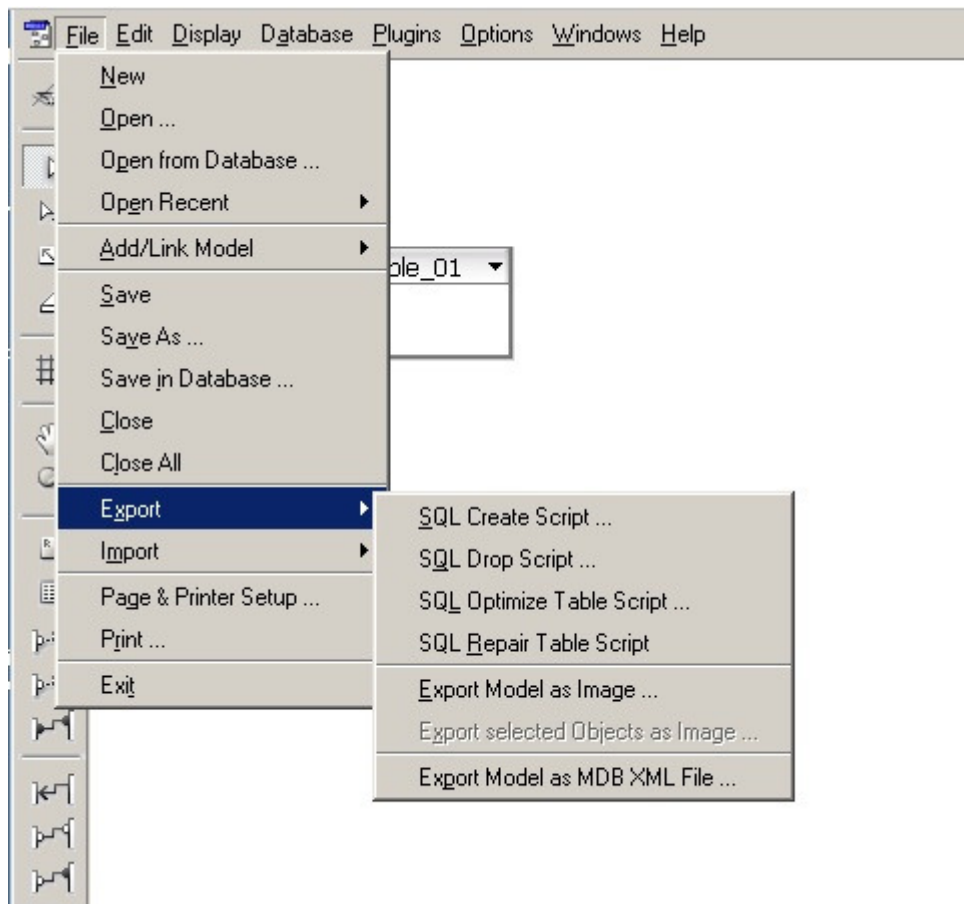


- To the diagram, click "File --> Save As ..." from the menu, and when the Save As window appears, save it on a suitable directory.



- The last step to complete the design process is to transform your ER model into a relational database schema, which is a set of SQL CREATE TABLE statements. (We are not going to create the database yet, but will be doing so in a future lab session). Click on "File --> Export --> Create SQL script" on the menu.





15. When the "File Save" dialog box appears, assign a suitable filename.

